

## **GROWTH PERFORMANCE OF GROWING RABBITS FED ROASTED AFRICAN STAR APPLE (*CHRYSOPHYLLUM ALBIDUM*) KERNEL MEAL BASED DIETS**

**\*Makinde, O.J.<sup>1</sup>, Aremu, A.<sup>2</sup>, Alabi, O.J.<sup>2</sup>, Jiya, E.Z<sup>2</sup> and Okunade, S.A<sup>3</sup>**

<sup>1</sup>Department of Animal Science, Federal University, Gashua, Nigeria.

<sup>2</sup>Department of Animal Production, Federal University of Technology, Minna, Niger State, Nigeria.

<sup>3</sup>Department of Animal Production Technology, Federal College of Wildlife Management, New Bussa, Niger state, Nigeria.

\*Corresponding Author's Email- [johyinmak@yahoo.com](mailto:johyinmak@yahoo.com) +2348038365322

### **ABSTRACT**

A 12-week study was carried out to examine the effect of substituting dietary maize with roasted African star apple kernel meal (RASAKM) on growth performance of growing rabbits. A total of forty eight weaner rabbits (mixed breed, average weight, 590 g) were randomly allocated to four experimental diets containing 0, 5, 10 and 15 % RASAKM as substitute for dietary maize in a Completely Randomized Design. The rabbits were pre-conditioned for two weeks, during which they were treated twice (once a week) against parasitic infestation with Ivermectin subcutaneously. The data generated were subjected to statistical analysis software package, to compare the means. Significance was accepted at  $P < 0.05$ . Roasted ASAKM had significant influenced ( $P < 0.05$ ) on daily weight gain and feed conversion ratio of the rabbits while daily feed intake was not affected ( $P > 0.05$ ). Rabbits fed 5 and 10 % RASAKM diets had similar ( $P > 0.05$ ) weight gain (15.17 g and 15.61 g) with those fed the control diet (16.24 g) while rabbits fed 15 % RASAKM diet had the least weight gain (14.07 g). It was concluded that RASAKM could be used up to 10 % to replace dietary maize in the diet of growing rabbits without compromising growth performance.

**Key words;** rabbits, African star apple, maize, performance, roasted

### **INTRODUCTION**

Nutritionally, rabbit meat is high in protein but low in fat and cholesterol, and highly digestible with dressing percentage of up to 85% (1). (2) stated that conventional feeds account for about 70% of total cost of rabbit production making them expensive to most farmers.

Recent difficulties with animal production inputs in Nigeria and the high cost of feed ingredients in particular have brought about the need to look for cheaper alternatives to the conventional feed resources. These products could be cheaply available for compounding livestock feeds as it will reduce or remove the competition between man and livestock (3).

African star apple (*Chrysophyllum albidum*), a wildy grown plant in the Southwestern part of Nigeria belongs to the family of trees known as *Sapotaceae*. It is commonly known as "Agbalumo" or "Osan" (Yoruba) or "Udala" (Igbo) in the local languages. Nutritionally, *Chrysophyllum albidum* kernels have been reported to contain 14.66 % moisture, 10.13% crude protein, 1.22 % crude fibre, 9.72 % lipid and 7.25 % ash (4).

The pink-coloured pulp and the whitish cover of the brown-coloured seeds of the fruit are consumed, while the empty pale yellow pericarp is discarded. This by-product can, however, be fed to Poultry (5). Currently, its use in rabbit feeding is limited, hence the need for further research. This study was therefore, conducted to evaluate the effect of substituting dietary maize with roasted African star apple kernel meal (RASAKM) on growth performance of growing rabbits.

## MATERIALS AND METHODS

### Experimental site

The experiment was conducted at the Rabbitry Unit of the Teaching and Research Farm of the School of Agriculture and Agricultural Technology of the Federal University of Technology, Gidan Kwano Campus (Permanent site), Minna, Niger State. Minna is located within latitudes 4°30' 09°30' and 09°45'N and longitudes 06° 30' and 06°45 'E with an altitude of 1475 m above sea level (6). The area falls within the Southern Guinea Savannah vegetation zone of Nigeria with annual rainfall of between 1100 and 1600 mm and a mean temperature of between 21°C and 36.5°C (6). Minna experiences two distinct seasons; dry season (November to March) and wet or rainy season (April to October).

### Experimental design and management of experimental animals

A total of forty eight (48) weaner rabbits of composite breeds and mixed sexes, aged between 5 and 6 weeks were procured from the rabbit section of National Animal Production Research Institute (NAPRI), Shika – Zaria, Kaduna State, Nigeria. They were randomly divided into four groups of twelve (12) rabbits per treatment with each treatment replicated thrice (4 rabbits per replicate) in a completely randomized design. The rabbits were housed according to treatments in a well-ventilated room in hutches. The hutches were fitted with drinkers and feeders. The rabbits were pre-conditioned for two weeks, during which they were treated twice (once a week) against parasitic infestation with Ivermectin subcutaneously. They had access to feed and clean water *ad libitum* for the 12 weeks experimental period.

### Experimental diets

Four experimental diets were formulated and designated as T1, T2, T3 and T4. Diet T1 served as control diet while Diets T2, T3 and T4 contained 5, 10 and 15 % RASAKM as substitute for maize in rabbit diets as shown in Table 2. A known quantity of the diets was served twice daily at 8.00am and 4.00pm and supplemented with 10 g of *Tridax procumbens* per animal per day.

**Table 1: Proximate Composition of Roasted African star apple kernels**

Nutrients,%	Roasted kernel
Dry matter	93.09
Crude Protein	10.81
Crude fibre	5.10
Ether extract	1.70
Ash	1.55
Nitrogen free extract	73.93
Gross energy (Kcal/100 g)	401.21
Metabolizable energy (Kcal/kg ME)	3163.37

**Table 2: Gross Composition of Experimental Diets**

Ingredients (%)	Control	Roasted Kernels		
	0%	5%	10%	15%
Maize	40.00	38.00	36.00	34.00
<b>Roasted</b>	0.00	2.00	4.00	6.00
Maize offal	25.00	25.00	25.00	25.00
Rice offal	18.00	18.00	18.00	18.00
Soyabean meal	2.00	2.00	2.00	2.00
Fish meal	1.20	1.20	1.20	1.20
Groundnut cake	10.00	10.00	10.00	10.00
Limestone	1.00	1.00	1.00	1.00
Bonemeal	2.00	2.00	2.00	2.00
Salt	0.20	0.20	0.20	0.20
*Premix	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Calculated Nutrients</b>				
Crude protein (%)	17.41	16.85	16.85	16.85
Energy (Kcal/kg ME)	2647.50	2604.03	2604.03	2604.03
Crude fibre (%)	10.35	10.05	10.05	10.05
Ether extract (%)	4.08	4.11	4.11	4.11
Ca (%)	1.05	1.12	1.12	1.12
Avail. P	0.69	0.51	0.51	0.51

\*Premix in diets provided per kg: Vit. A 10000 IU, Vit. B 2000 IU, Vit. E 13000 IU, Vit. K 1500mg, Vit. B12 10mg, Riboflavin 5000mg, Pyridoxine 1300mg, Thiamine 1300mg, Panthothenic acid 8000mg, Nicotinic acid 928000mg, Folic acid 500mg, Biotin 40mg, Copper 7000mg, Manganese 48000mg, Iron 58000mg, Zinc 58000mg, Selenium 120mg, Iodine 60mg, Cobalt 300mg, Choline 27500mg

## Data collection

### Growth performance study

Rabbits were weighed individually at the beginning of the experiment and weekly thereafter for the duration of the experiment using weighing scale. Weighing was done before the morning feeding. The parameters determined for the evaluation of growth performance were initial weight (g), average feed intake (g), average weight gain (g) and feed conversion ratio. Weight gain for each animal was calculated by subtracting the initial weight (g) from the final weight (g), while the feed conversion ratio was calculated by dividing the average feed intake (g) by the average weight gain (g).

### Chemical analysis

Proximate composition of roasted African star apple kernel and experimental diets were analysed using the methods described by (7).

### Statistical analysis

Data collected were subjected to analysis of Variance using SAS software (8) while significant means were separated with Duncan multiple range test at 5% level of significance.

## RESULTS

Table 1 shows the proximate composition of the roasted African star apple kernel meal used for the study. Results of the effect of RASAKM on performance of growing rabbits (Table 3)

show that dietary treatments had effect on final weight, total weight gain, daily weight gain, feed conversion ratio and protein efficiency ratio. However, the daily feed intake was not influenced by RASAKM diets. Rabbits fed 0, 5 and 10% RASAKM diets had similar ( $P>0.05$ ) final weight, total weight gain, daily weight gain and PER. However, rabbits fed 15% RASAKM had lower ( $P<0.05$ ) final weight, total weight gain and daily weight gain.

**Table 3: Effect of roasted African star apple kernel meal on growth performance of growing rabbits**

Levels, %	Initial weight, g	Final weight, g	Total weight gain, g	Dailyweight gain, g	Daily feed intake, g	FCR	PER	EER
0	584.39	1948.60 <sup>a</sup>	1364.21 <sup>a</sup>	16.24 <sup>a</sup>	59.93	3.69 <sup>a</sup>	1.84 <sup>a</sup>	1.89
5	594.60	1868.64 <sup>a</sup>	1274.04 <sup>a</sup>	15.17 <sup>a</sup>	61.18	4.04 <sup>a</sup>	1.78 <sup>a</sup>	1.94
10	587.94	1899.20 <sup>a</sup>	1311.26 <sup>a</sup>	15.61 <sup>a</sup>	60.95	3.91 <sup>a</sup>	1.69 <sup>ab</sup>	1.56
15	591.44	1773.07 <sup>b</sup>	1181.62 <sup>b</sup>	14.07 <sup>b</sup>	60.08	4.28 <sup>b</sup>	1.58 <sup>b</sup>	1.82
SEM	7.05	48.93	46.05	1.66	1.53	0.20	0.11	0.21
P-val	0.229	0.001	0.001	0.001	0.699	0.001	0.001	0.101
LOS	NS	**	**	**	NS	**	**	NS

abc= means with different superscripts on the same column are significantly different ( $P<0.05^*$ ,  $P<0.01^{**}$ ), SEM= Standard error of mean, P = Probability value. LOS = Level of significant. NS = Not significant. FCR= feed conversion ratio. PER = Protein efficiency ratio. EER = Energy efficiency ratio

## DISCUSSION

Rabbits fed 15 % RASAKM replacement level had lowest final weight (1773.07 g) and average daily weight gain (14.07 g). The average daily weight gain of rabbits fed 0, 5 and 10 % RASAKM diets (16.24, 15.17 and 15.61 g/d respectively) were close to the weight range of 17.65 to 18.80 g/d recorded by (9) for rabbits fed cassava leaf and peel meal in association with palm oil sludge as energy source in rabbits diet but surpassed the values of 8.40 to 11.67 g/d reported for rabbits placed on varying levels of *Centrosema pubescens* or *Calapogonium mucunoides* (10) and 12.60 to 16.09 g/d reported by (11) for rabbits fed cereal by-products. It was however lower than 21.14 to 25.36 g/d reported by (12) for rabbits fed Sorghum-offal based diets as energy source. The differences in these observations could be attributed to the variations in the chemical composition of various ingredients used and climatic factors such as temperature since these studies were conducted at different locations. (13) had earlier reported that high ambient temperature such as the one in the tropics depresses feed intake and weight gain in rabbits.

## CONCLUSION

Considering the results of the final body weight, daily weight gain and feed conversion ratio, it was concluded that RASAKM could be used up to 10% to replace dietary maize in the diet of growing rabbits.

## ACKNOWLEDGEMENT

The authors gratefully acknowledge Abuks, John Kambai, Ijalana Hellen and Abdullahi Nafiu for their assistance in the collection of data pertaining to this study.

## REFERENCES

Yusuf, A.M., Amusa, T.O. and Olafadehan, O.A. (2011). Performance of growing rabbits fed diets containing raw, roasted and re-roasted *Azizelia Africana* seed meal. *Proceedings of the 36th Annual Conference of Animal Science Association of Nigeria (ASAN)*,

- March 13 -16th, Raw Material Research and Development Council, Abuja, Nigeria. Pp. 284-286.
- Akinmutimi, A.H. and Ezea, J. (2006). Effect of graded levels of toasted lima bean (*Phaseolus lunatus*) meal on weaner rabbit diets. *Pakistan Journal of Nutrition*. 5(4): 368-372, 2006.
- Alawa, J.P. and Umunna, N.N. (1993). Alternative feed formulation in developing countries: Prospects for utilization for Agro-industrial by-products. *Journal of Animal Production Research*.13 (2): 63-68.
- Agbabiaka, L.A., Eke, L.O. and Nwankwo, C.F. (2013). Nutrients and Phyto-Chemical Assay of African Star Apple Kernel (*Chrysophyllum africanum*) as Potential Feedstuff in Fish and Livestock Production. *British Journal of Applied Science and Technology*, 3(4), 1215-1219.
- Ajide, S.O., Amongu, A.A., Atteh, J.O., Izebere, J., Alabi, O.O. and Shoyombo, A.J. (2017). The effect of replacing maize with raw *Chrysophyllum albidum* seed kernels on the performance of broilers. Proc. 42<sup>nd</sup> Ann. Conf. Nigerian Society of Animal Production, 26<sup>th</sup> – 30<sup>th</sup> March, 2017, Landmark University, Omu- aran, Kwara State, Nigeria. Pp. 318- 321.
- Climatetemp. (2016). Minna climate information. <http://www.climatetemp.info/nigeria/minna.html>
- AOAC (Association of Official Analytical Chemists), (2006). Official Method of Analysis of the AOAC (W.Horwitz Editor) Eighteenth Edition. Washigton D.C, AOAC.
- SAS (2015). Statistical Analysis System Institute. User's guide. Version 9.3, SAS Institute Inc. Cary, N. C.
- Agunbiade, J.A., Adeyemi, O.A., Fasina, O.E., Ashorobi, B.A. Adebajo, M.A. and Waide, O.E. (1999). Cassava peels and leaves in diets of rabbits: Effects on performance and carcass characteristics. *Nigerian Journal of Animal Production*. 26: 29-34.
- Aderinola, O.A., Ojebiyi, O.O., Rafiu, T.A., Akinlade, J.A. and Adepoju, L.O. (2008). Performance evaluation of growing rabbits fed diets containing varying inclusion levels of *Centrosema pubescens* or *Calapogonium mucunoides* in the savannah zone of Nigeria. 9<sup>th</sup> World Rabbit Congress, Verona, Italy June 10- 13.
- Uko, O.J., Ataja, A.M. and Tanko, H.B. (1999). Response of rabbits to cereals byproducts as energy sources in diets. *Archivos Zootecnia*, 48(183): 285-293.
- Ogunsipe, M.H., Agbede, J.O. and Adedeji, O.A. (2014). Performance response, Carcass evaluation and economic benefit of Rabbits fed Sorghum offal-based diets. *African Journal of Food, Agriculture, Nutrition and Development*, 2014; 14 (1): 8585-8601.
- Lebas, F. (1983). Small scale rabbit production. Feed and management system. *World Animal Rev*. 46: 173-179.